SPC BENCHMARK 1™
EXECUTIVE SUMMARY

NEC CORPORATION
NEC STORAGE M510

SPC-1 V1.14

Submitted for Review: December 29, 2015
Submission Identifier: A00166

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Test Sponsor Alternate Contact	NEC Corporation of America – http://www.necam.com/ Chauncey Schwartz – chauncey.schwartz@necam.com 2880 Scott Blvd. Santa Clara, CA 95050 Phone: (952) 388-8466
Auditor	Storage Performance Council – http://www.storageperformance.org Walter E. Baker – AuditService@StoragePerformance.org 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	December 29, 2015
Date the FDR was submitted to the SPC	December 29, 2015
Date the Priced Storage Configuration is available for shipment to customers	Currently Available
Date the TSC completed audit certification	December 28, 2015

Tested Storage Product (TSP) Description

The NEC M510 SAN disk array is intended to serve as extremely scalable, high performance primary or tiered storage in mission critical environments. Virtual environments benefit from the high levels of performance achieved through exceptional scalability, LUN locking, VMware APIs support, as well as 96GB of cache and SSD options.

The mid-range M510 disk array offers linear performance scaling from 3 to 768 drives doubling the total number of disk drives supported from the previous generation M510 storage array.

Easy to operate, reliable and efficient, the M510 storage solution simultaneously supports SSDs, NearLine SAS and traditional SAS HDD in the same enclosure, enabling flexible tiered storage architecture.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: NEC Storage M510	
Metric	**Reported Result**
SPC-1 IOPS™	205,004.25
SPC-1 Price-Performance™	$3.02/SPC-1 IOPS™
Total ASU Capacity	85,896.611 GB
Data Protection Level	Protected 2 *(Mirroring)*
Total Price	$618,312.45
Currency Used	U.S. Dollars
Target Country for availability, sales and support	USA

SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

SPC-1 Price-Performance™ is the ratio of **Total Price** to **SPC-1 IOPS™**.

Total ASU (Application Storage Unit) **Capacity** represents the total storage capacity available to be read and written in the course of executing the SPC-1 benchmark.

A **Data Protection Level** of **Protected 2** using ***Mirroring*** configures two or more identical copies of user data..

> ***Protected 2:*** *The single point of failure of any* ***storage device*** *in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.*

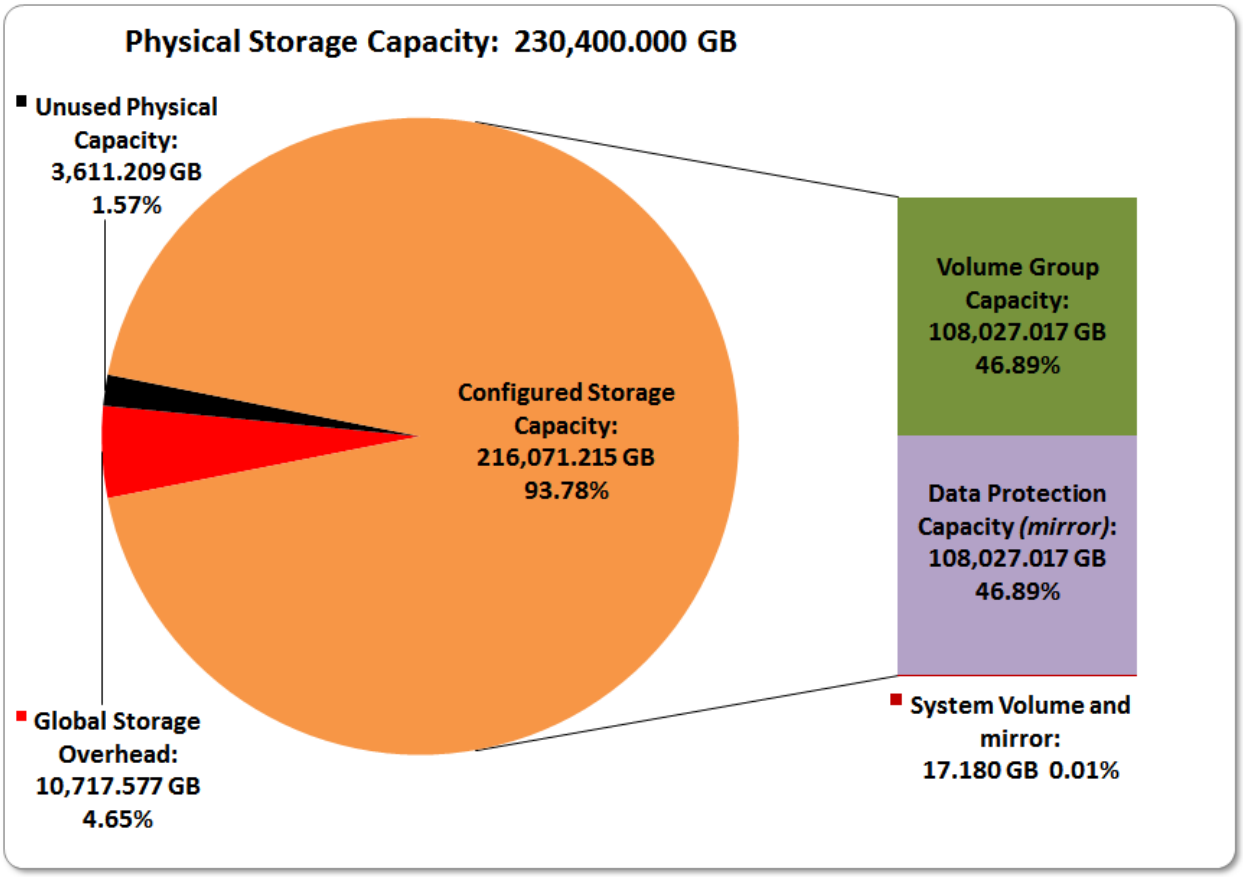
Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 9.

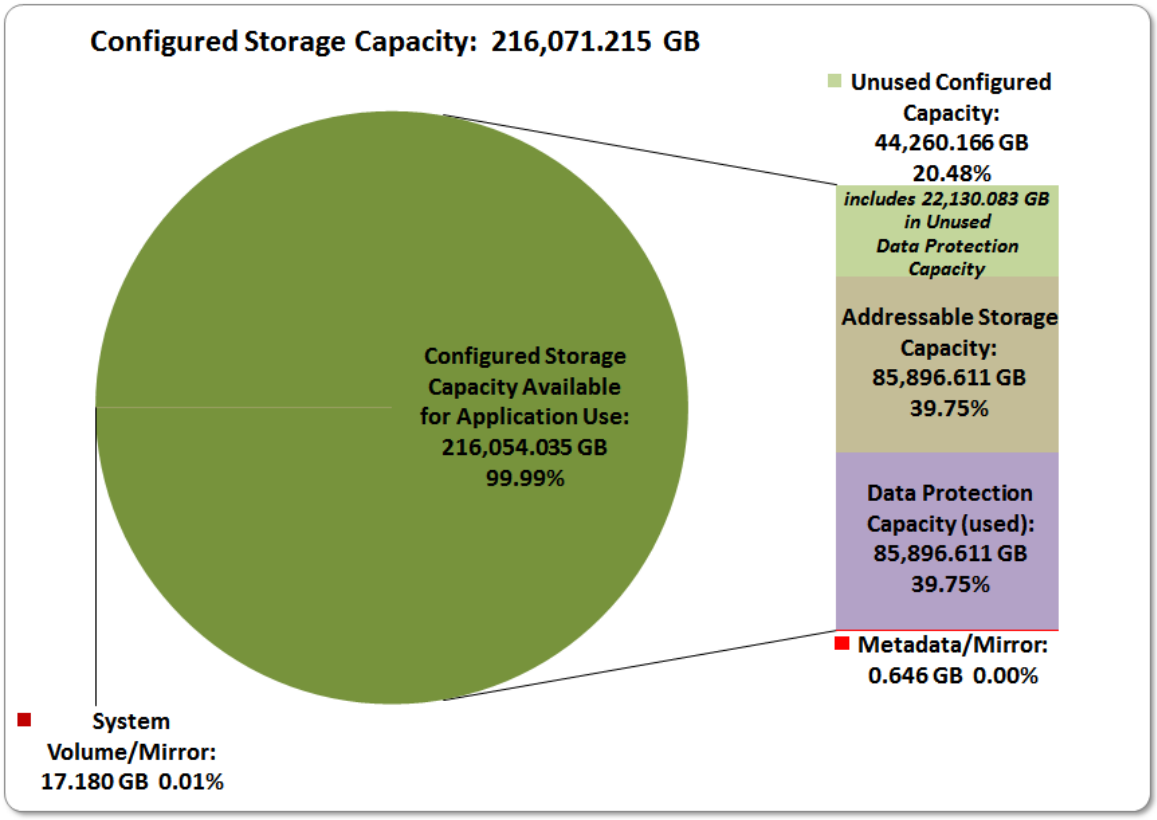
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country *(non-local currency)*.

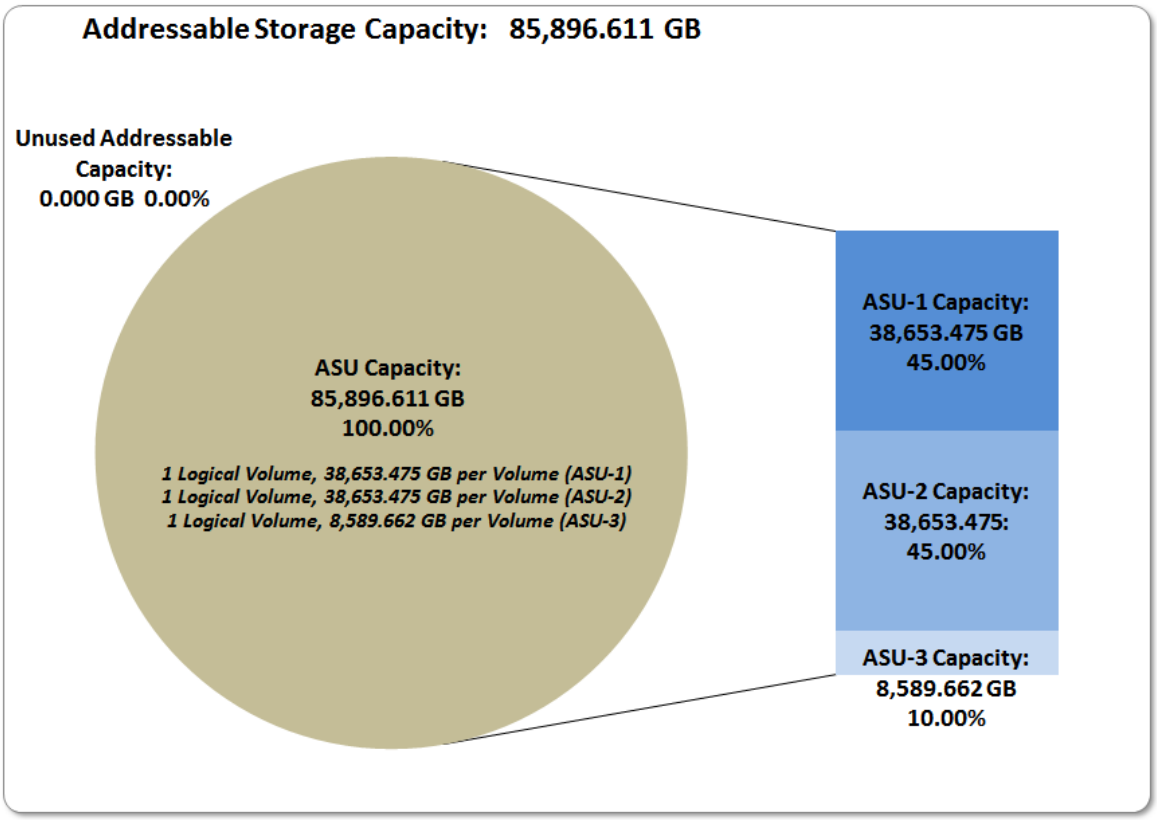
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

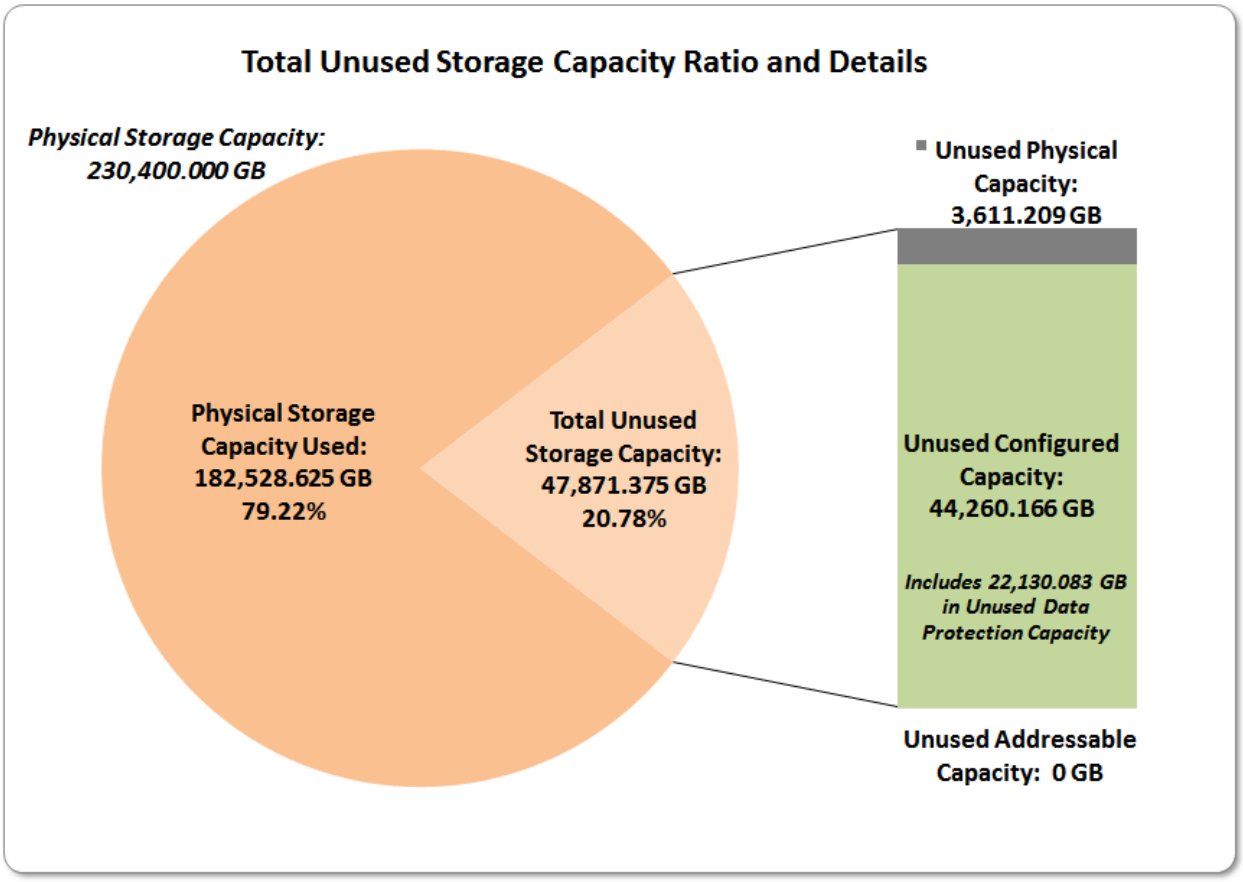
Storage Capacities, Relationships, and Utilization

The following four charts and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.




Configured Storage Capacity: 216,071.215 GB
Unused Configured Capacity: 44,260.166 GB 20.48%
includes 22,130.083 GB in Unused Data Protection Capacity
Addressable Storage Capacity: 85,896.611 GB 39.75%
Data Protection Capacity (used): 85,896.611 GB 39.75%
Metadata/Mirror: 0.646 GB 0.00%
Configured Storage Capacity Available for Application Use: 216,054.035 GB 99.99%
System Volume/Mirror: 17.180 GB 0.01%


Addressable Storage Capacity: 85,896.611 GB
Unused Addressable Capacity: 0.000 GB 0.00%
ASU Capacity: 85,896.611 GB 100.00%
1 Logical Volume, 38,653.475 GB per Volume (ASU-1)
1 Logical Volume, 38,653.475 GB per Volume (ASU-2)
1 Logical Volume, 8,589.662 GB per Volume (ASU-3)
ASU-1 Capacity: 38,653.475 GB 45.00%
ASU-2 Capacity: 38,653.475: 45.00%
ASU-3 Capacity: 8,589.662 GB 10.00%



SPC-1 Storage Capacity Utilization	
Application Utilization	37.28%
Protected Application Utilization	74.56%
Unused Storage Ratio	20.78%

Application Utilization: Total ASU Capacity *(85,896.611 GB)* divided by Physical Storage Capacity *(230,400.000 GB)*.

Protected Application Utilization: (Total ASU Capacity *(85,896.611 GB)* plus total Data Protection Capacity *(108,027.017 GB)* minus unused Data Protection Capacity *(22,130.083 GB)*) divided by Physical Storage Capacity *(230,400.000 GB)*.

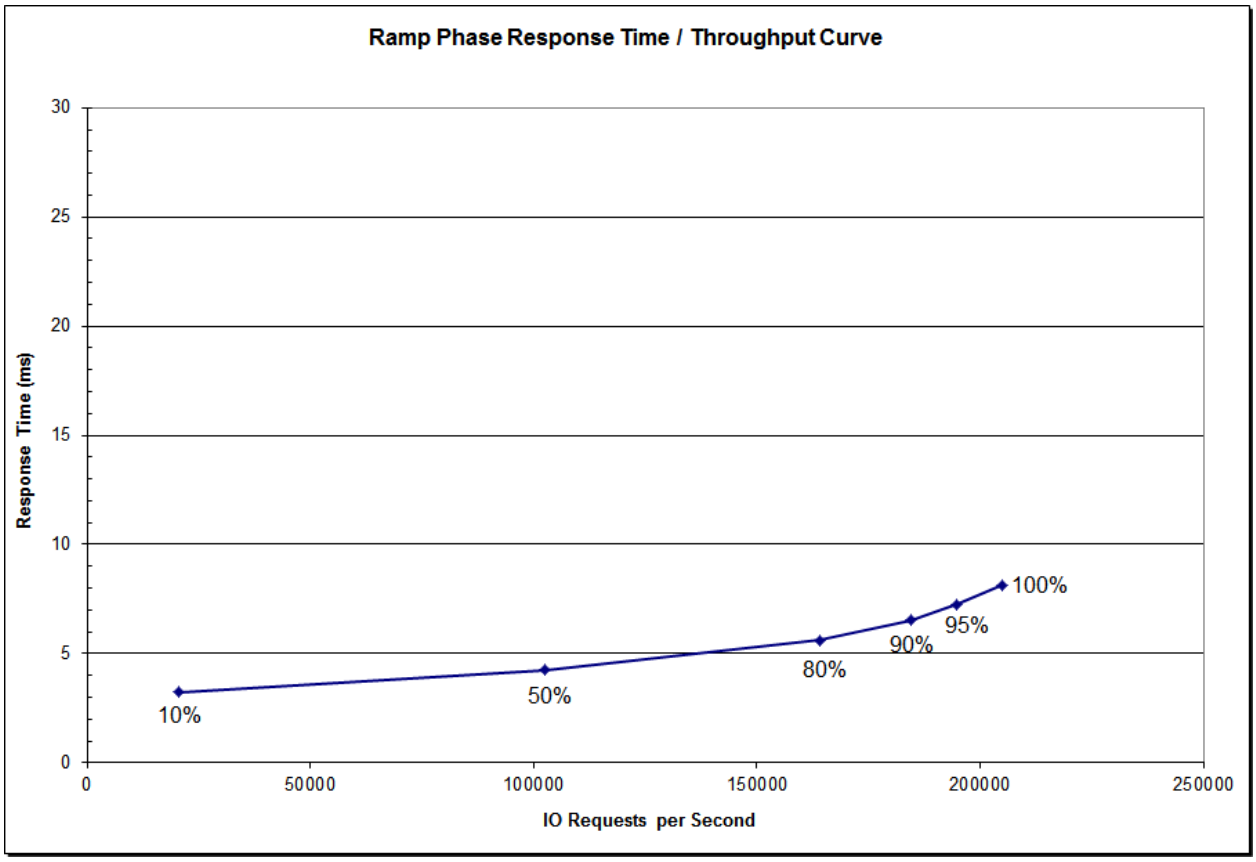
Unused Storage Ratio: Total Unused Capacity *(47,871.375 GB)* divided by Physical Storage Capacity *(230,400.000 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 26-27 in the Full Disclosure Report.

Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPS™ metric.

The Average Response Time measured at the any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.



Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	20,504.58	102,498.33	164,021.39	184,491.08	194,757.20	205,004.25
Average Response Time (ms):						
All ASUs	3.23	4.26	5.63	6.54	7.25	8.15
ASU-1	2.89	4.69	7.07	8.48	9.38	10.42
ASU-2	2.62	4.83	7.90	10.03	11.52	13.31
ASU-3	4.22	3.09	1.56	0.90	0.88	1.07
Reads	4.78	8.13	12.42	15.10	16.79	18.69
Writes	2.22	1.74	1.20	0.97	1.04	1.28

Priced Storage Configuration Pricing

SKU	Description	Quantity	Unit List Price	Extended List	Discount	Extended Discount
Hardware						
NF5322-SFP16E	2 - 16Gb FC SFPs	16	$367.00	$ 5,872.00	20%	$ 4,697.60
NF5352-SR00E	M510 Dual Controller Disk Array Unit w Base SW (w 2 - 4 port Disk Port Cards, w/o Host Port Card, SFP or Cache Memory)	1	$54,899.00	$ 54,899.00	20%	$ 43,919.20
Q24-HL000000072891	Localization Kit for M510/M710 Disk Array Unit	1	$ -	$ -	20%	$ -
NF5352-SF06WE	M510 2 - 4 port FC Host Port Cards (4 ports per controller) w/o SFP	4	$3,491.00	$ 13,964.00	20%	$ 11,171.20
NF5352-SD01WE	M510 2 - 4 port Disk Port Cards (4 ports per controller)	1	$2,961.00	$ 2,961.00	20%	$ 2,368.80
NF5352-SC12E	M510 Cache Memory Upgrade 24GB to 48GB per Controller (48GB to 96GB total cache)	1	$3,743.00	$ 3,743.00	20%	$ 2,994.40
NF5322-SMA75E	SAS Disk Drive (2.5" 15krpm/300GB)	768	$489.00	$375,552.00	20%	$ 300,441.60
NF5322-SE81E	Disk Enclosure 2.5 inch for Mx10	32	$5,427.00	$173,664.00	20%	$ 138,931.20
Q24-HL000000072706	Localization Kit for Mx10 Disk Enclosure	32	$ -	$ -	20%	$ -
NF9100-SF26E	Front Bezel (4U Black, w/ NEC Logo) for Mx10	1	$ 123.00	$ 123.00	20%	$ 98.40
NF9100-SF22E	Front Bezel (2U Black, w/ NEC Logo) for Mx10	32	$ 90.00	$ 2,880.00	20%	$ 2,304.00
N8190-158	NEC N8190-158 dual-port 16G FC HBAs (w/ SFP)	16	$1,570.00	$ 25,120.00	20%	$ 20,096.00
Software						
Q24-HL000000074243	M510 60 Day Trial License Bundle	1	$ -	$ -	20%	$ -
Q24-HL000000072866	M510 Base Software	1	$ -	$ -	20%	$ -
Maintenance						
Q24-DN000000072495	3 Years Upgrade to Platinum M510 Dual Controller w/Base SW	1	$9,471.00	$ 9,471.00	15%	$ 8,050.35
Q24-DN000000072679	3 Years Upgrade to Platinum M510 2 - 4 port FC Host Port Cards (4 ports per Controller)	4	$1,222.00	$ 4,888.00	15%	$ 4,154.80
Q24-DN000000072686	3 Years Upgrade to Platinum M510 2 - 4 port Disk Port Cards (4 ports per Controller)	1	$1,037.00	$ 1,037.00	15%	$ 881.45
Q24-DN000000072544	3 Years Upgrade to Platinum M510 Cache Upgrade 24GB->48GB per Controller (48GB->96GB Total)	1	$1,311.00	$ 1,311.00	15%	$ 1,114.35
Q24-DN000000072609	3 Years Upgrade to Platinum Disk Enclosure 2.5 inch for Mx10	32	$1,900.00	$ 60,800.00	15%	$ 51,680.00
Q24-DN000000072927	1 Year Platinum SW Maintenance M510 Base Software	3	$ 5,620.00	$ 16,860.00	15%	$ 14,331.00
Cables and Racks						
Power Strips	Power Strips (8 outlets)	10	$ 78.00	$ 780.00	10%	$ 702.00
RACK	Rack 42U	3	$ 1,799.00	$ 5,397.00	10%	$ 4,857.30
NF9120-SJ93	2 - 3M Mini SAS HD Cables	12	$439.00	$ 5,268.00	10%	$ 4,741.20
FC CABLE	CRU FC CABLE 5M x2 (M#LCLC-5MQ) 5M	16	$54.00	$ 864.00	10%	$ 777.60
	Totals			**$765,454.00**		**$618,312.45**

- *Power codes for M510 and Disk Enclosures are included in Localization Kits (Q24-HL000000072891 and Q24-HL000000072706)*
- *Price of M510 Disk Array Unit includes price of M510 Base Software (Q24-HL000000072866)*
- *PathManager for Windows/Linux/VMware is included in M510 Base Software (Q24-HL000000072866)*

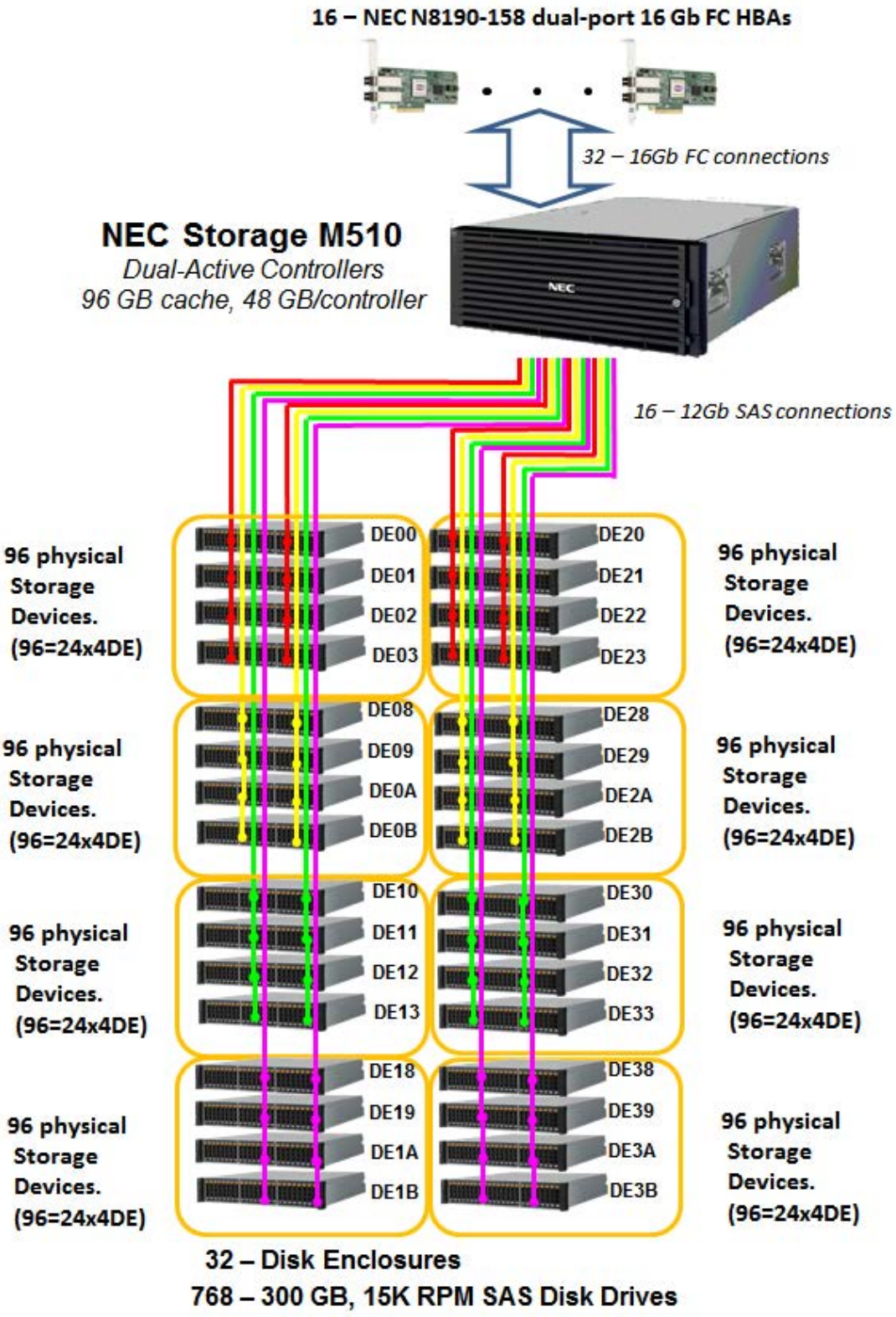
The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems within four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration that can be remedied by the repair or replacement of a Priced Storage Configuration component.

Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

There were no differences between the Tested Storage Configuration and the Priced Storage Configuration.

Priced Storage Configuration Diagram



Priced Storage Configuration Components

Priced Storage Configuration
16 – NEC N8190-158 dual-port 16Gb FC HBAs
NEC Storage M510 Dual-Active Controllers, each with 48 GB memory *(96 GB total)* 1 – 4-port Disk Port Card *(2 cards total, 8 ports total and used)*
8 – 4-port FC Host Port Cards *(4 cards and 16 ports per controller, 32 ports total and used)*
2 – 4-port Disk Port Cards *(1 card and 4 ports per controller; 8 ports total and used)*
32 – Disk Enclosures, 2.5”
768 – 300 GB, 15K RPM SAS disk drives (HDDs)
3 – 42U Racks with 10 power strips *(8 outlets per strip)*